ICOS (Integrated Carbon Observing System)

A world-class **research infrastructure** to quantify and understand **greenhouse gas** fluxes from long-term measurements over Europe

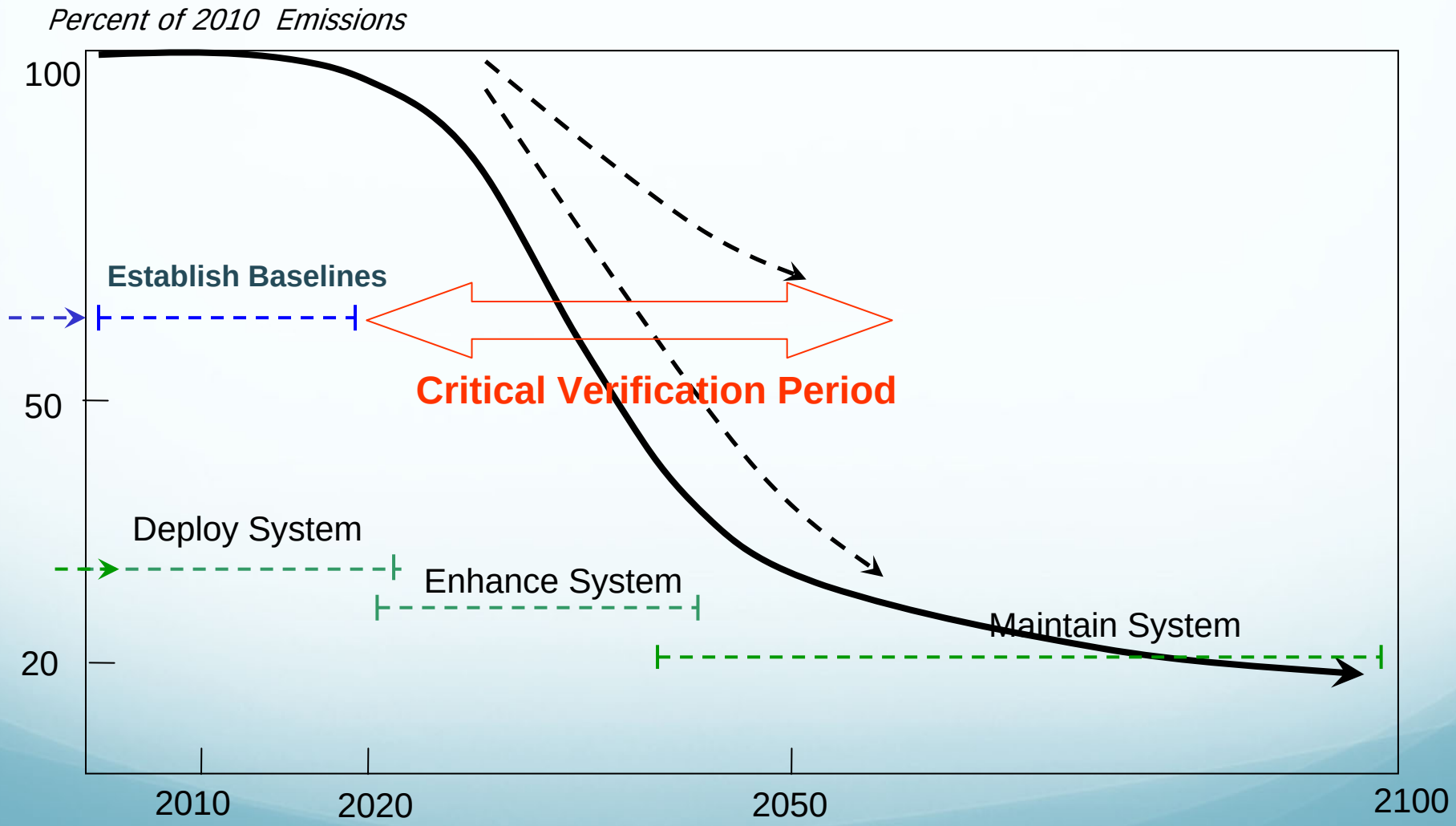
http://www.icos-infrastructure.eu/

Jean-Daniel.Paris@lsce.ipsl.fr

Features of ICOS

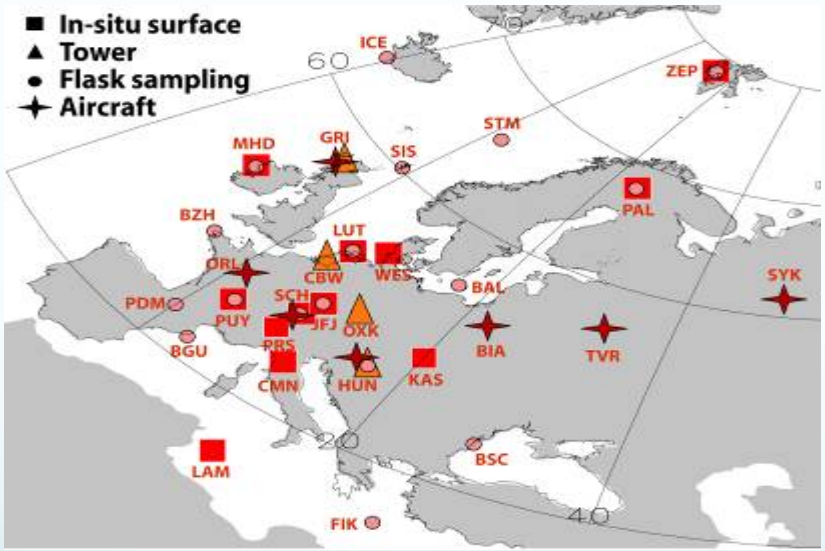
- A monitoring network infrastructure
  - Large potential for discovering processes controlling the biogeochemical cycles of greenhouse gases
  - Enable emissions monitoring and verification
- Currently in its Preparation phase (coordinated by LSCE)
  - Station prototypes, harmonization of measurements;
  - Central Facilites,
  - Legal organization and business model
- Research infrastructure features:
  - Same sensors at all the stations
  - Centralized near real time data processing
  - Contribution to global Earth Observation programmes GEOSS, WMO)
  - Operational flux estimations, using models

A roadmap to track GHG emissions reduction

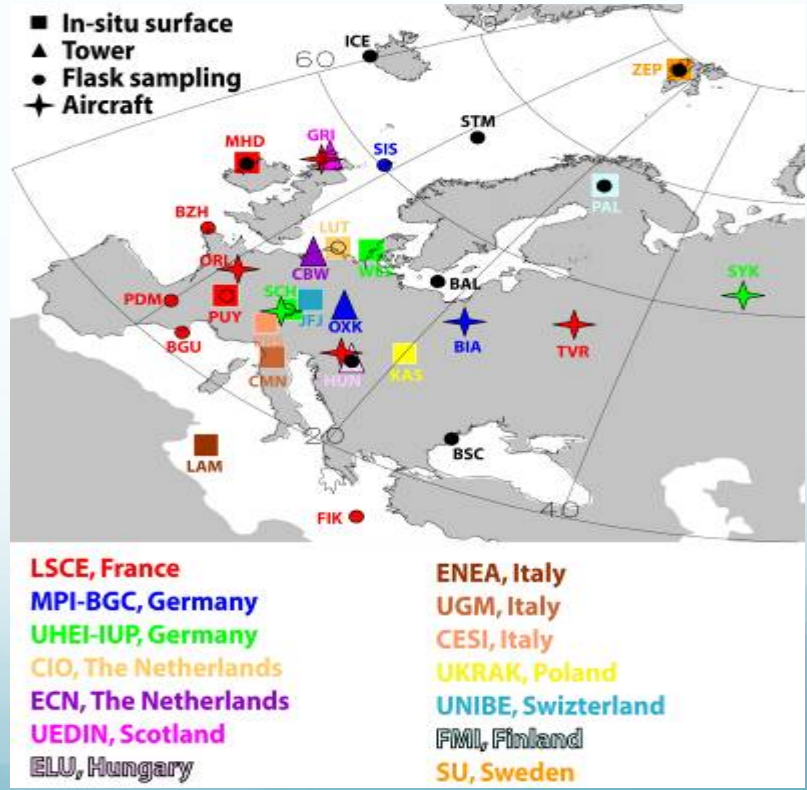


Monitoring in ‘research’ mode

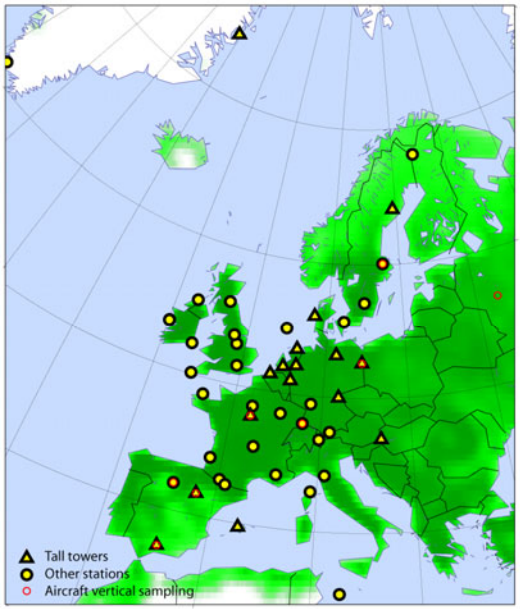
The dense European Carbon observation network …



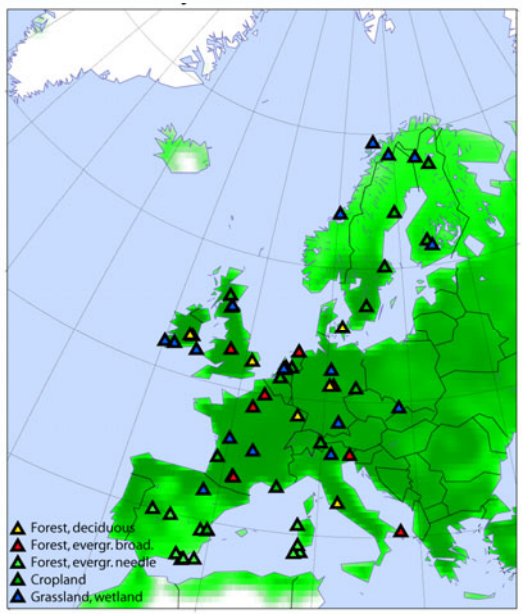
… has high ‚biodiversity‘



Long-term measurement network dedicated to greenhouse gases



Atmospheric network



Ecosystem network

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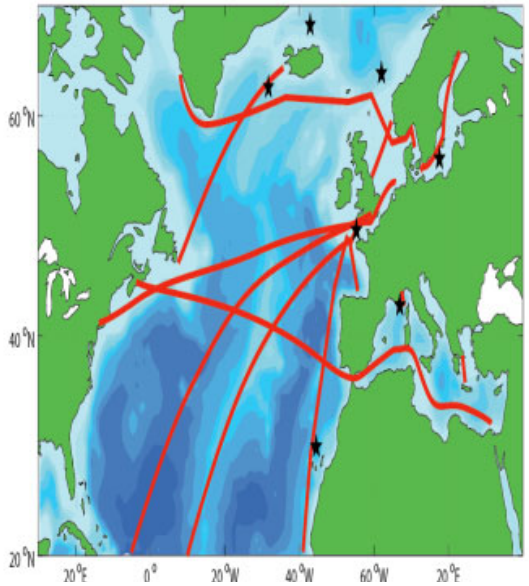
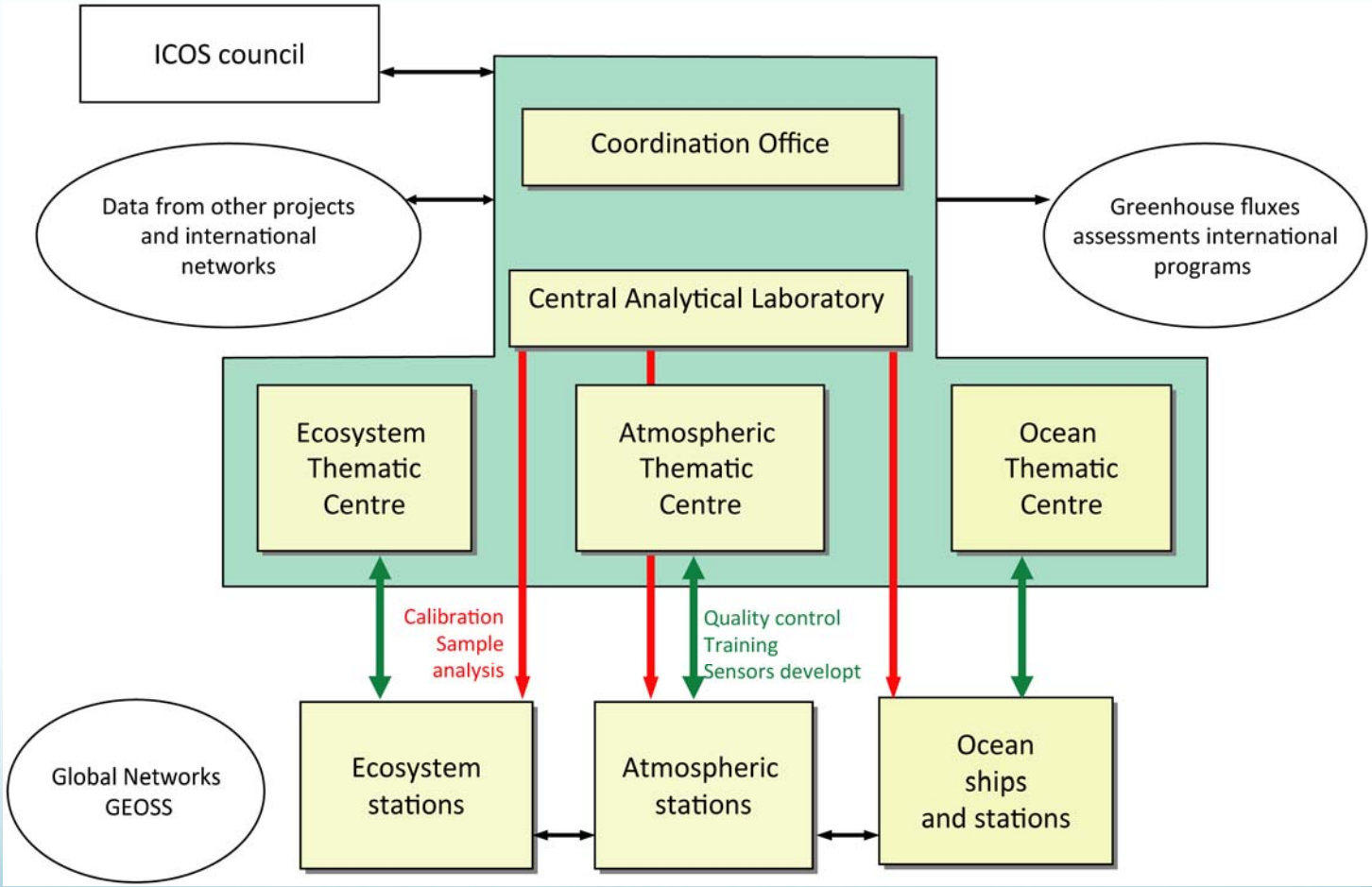
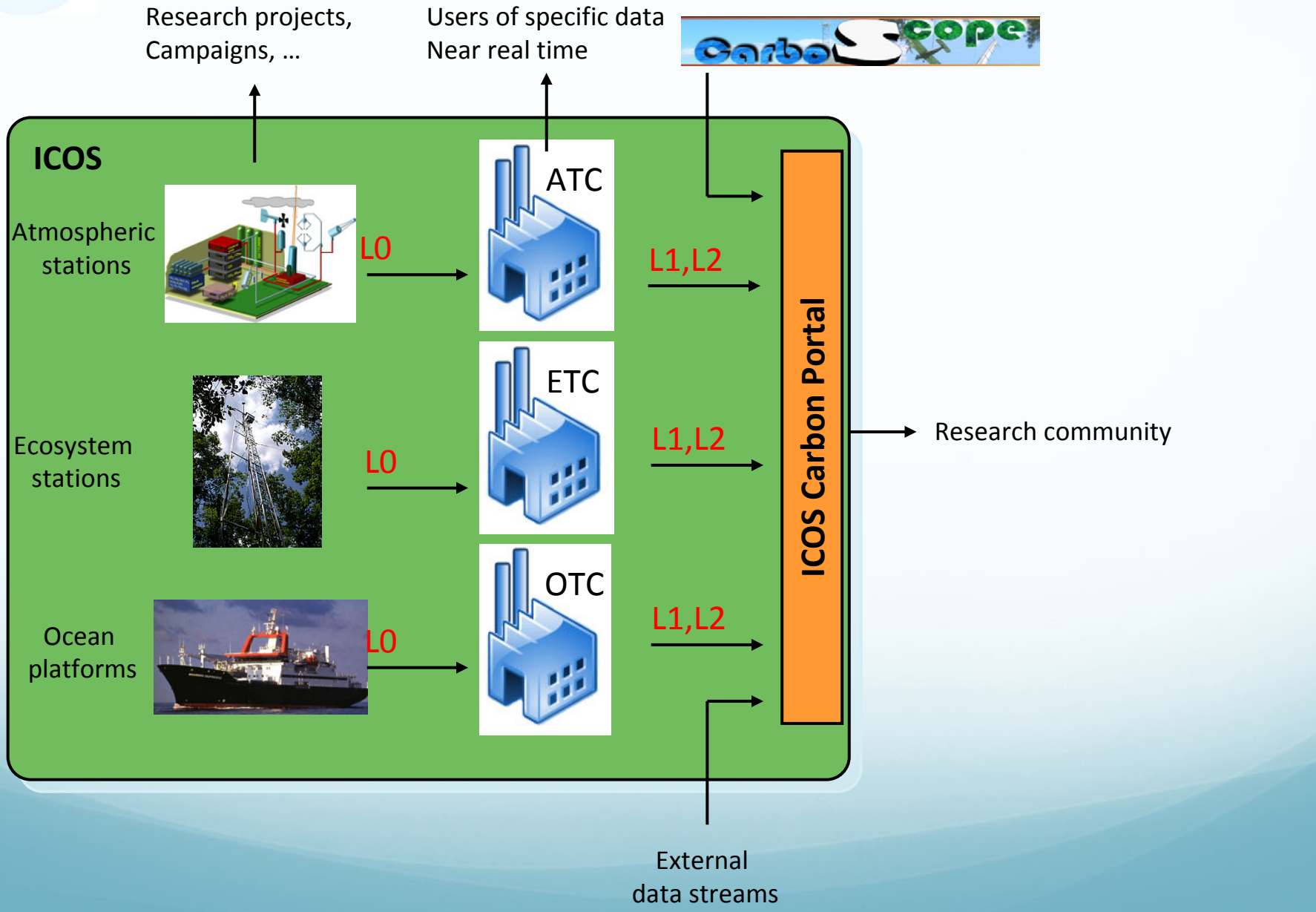


10 ocean ship-lines

ICOS: operational organisation



ICOS data stream



Agenda to build ICOS

Carboeurope
Other research projects
National networks

Science case
2001-2008

Preparatory
2008-2011

Month 36 : Legal status accepted

Month 48: First stations operational

Month 48: All infrastructure facilities in place

Construction
2009-2013

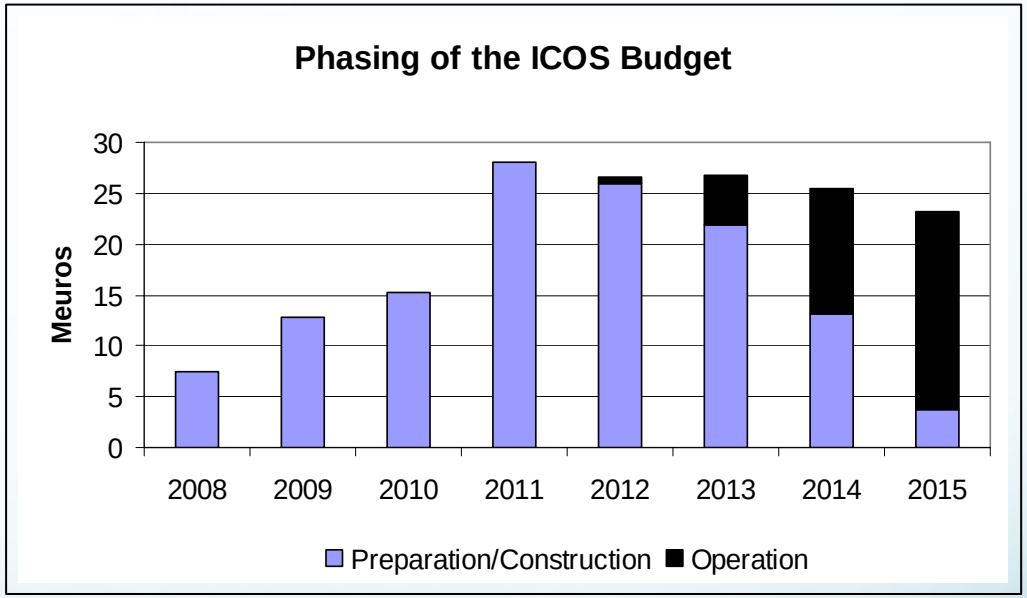
Operational
> 2013

Month 24: Stations prototypes developed

Month 24 Centers (sites) location recommendations

Budget ICOS

- Total construction cost: 128 M€, operation cost: 14 M€/yr
- Single atmospheric station:
  - Level 1: 315 k€
  - Level 2: >200k€
  - Picarro CO2/CH4: ~50 k€
- Single ecosystem station:
  - Level 1: 110 k€
  - Level 2: >70 k€
- Atmospheric thematic center:
  - Construction cost: 1.8 M€ (+equivalent upgrade cost every 5 yr)
  - Operation cost: 190 k€/yr
  - Personnel: 990 k€/yr

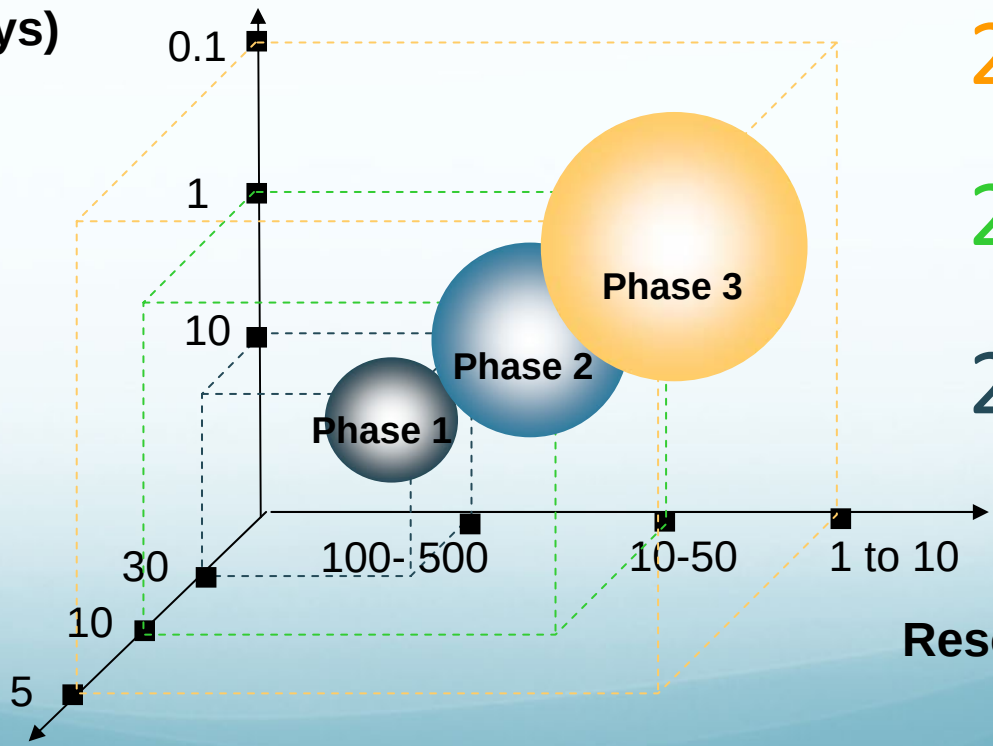


Delivering useful information for management strategies

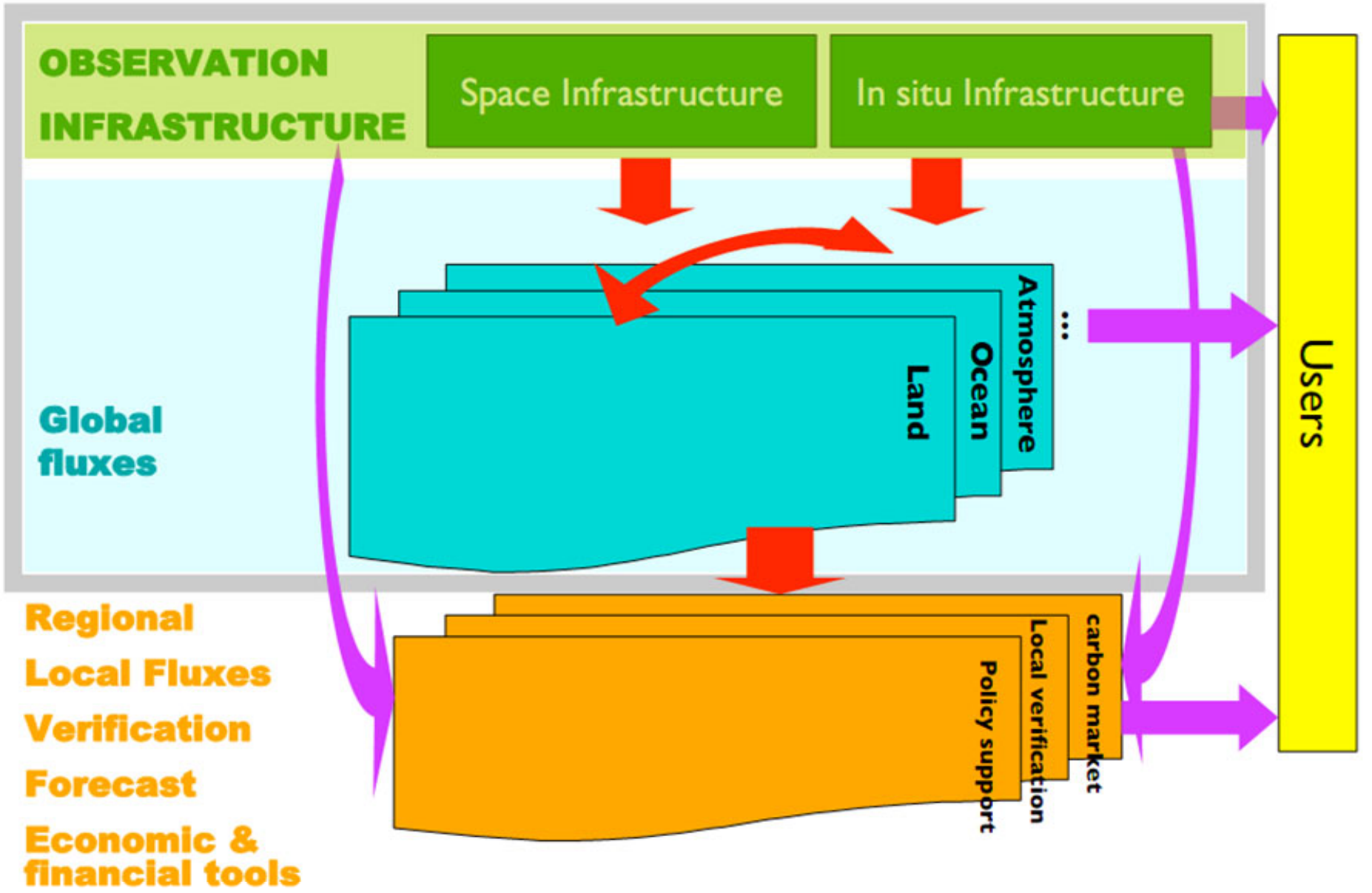
- Country-level constraints on net emissions & ecosystem carbon stocks
- Assessments of the effectiveness of greenhouse gas management strategies
- Evaluation of changes in biosphere or ocean feedbacks
- Early warning of rapid greenhouse gas release events

Deployment of a global carbon system

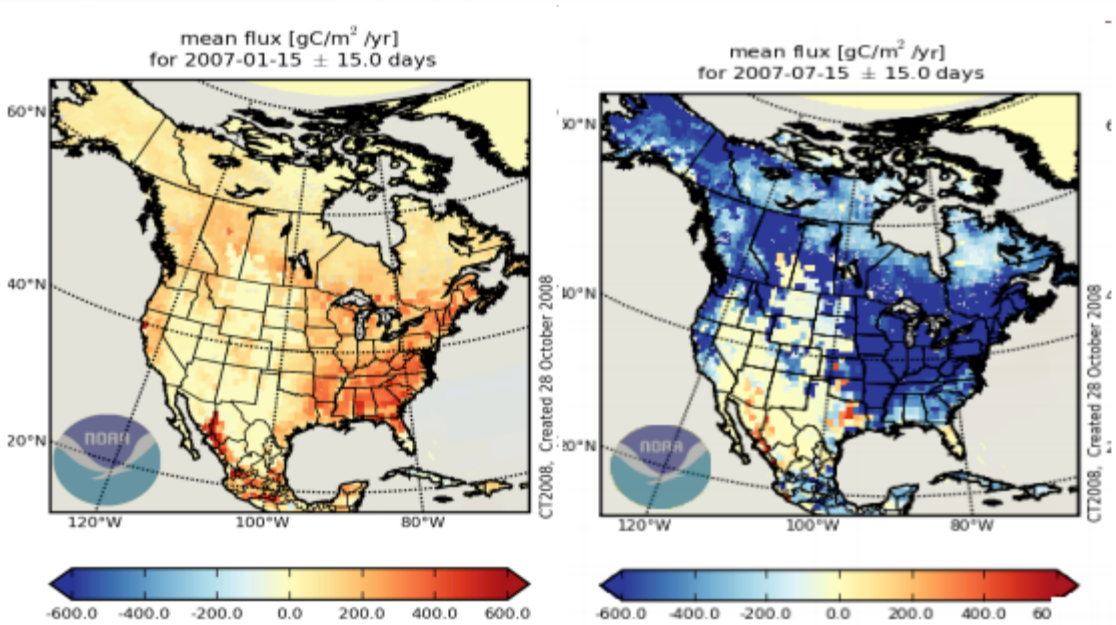
- Ecosystem, Ocean, Atmospheric & Energy models are the “Software Engines” of the system operation
- Deployment cost of terrestrial & space components will depend on these “Engines” performances & scalability

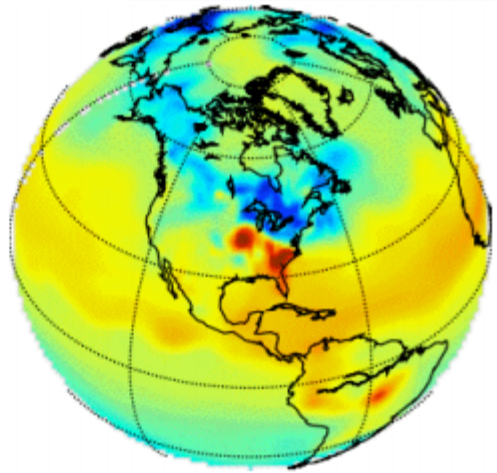


From global observation to user services



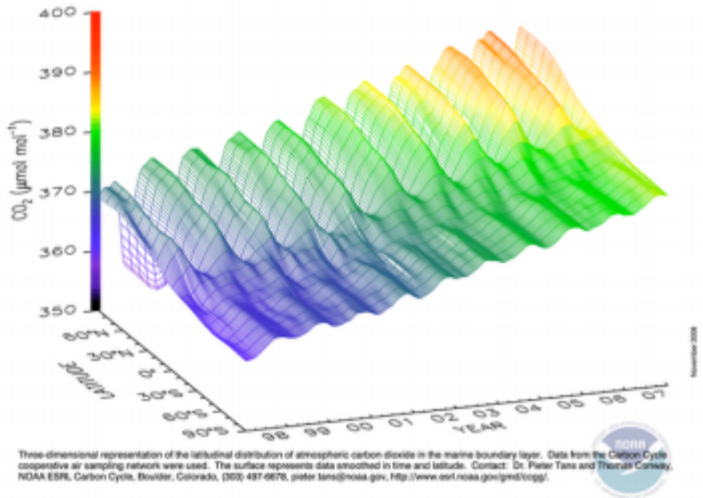
CarbonTracker (NOAA)





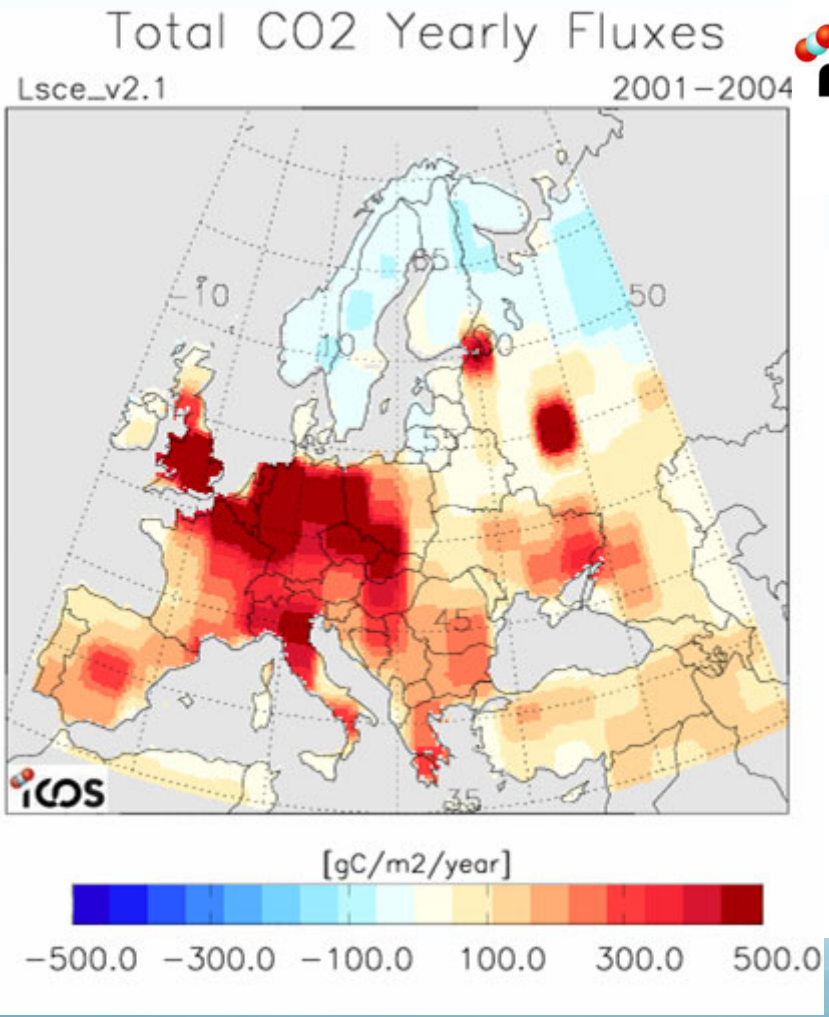
CarbonTracker also produces "carbon weather", which shows the hourly distribution of CO2 in Earth's atmosphere.

CarbonTracker is a reanlysis constrained by NOAA's global atmospheric observing network. CarbonTracker determines fluxes of CO_2 to and from the biosphere. Note that, in January, CO_2 is emitted into the atmosphere and, in July, the biosphere removes CO2 from the atmosphere.



3D-View of increasing carbon dioxide in the atmosphere

http://www.icos-infrastructure.eu/
http://www.carboscope.eu



integrated carbon observation system

CarboScope

Greenhouse gases at the Earth's surface